The American Biology Teacher

A service publication of
The National Association of Biology Teachers
teaching the life sciences from elementary grades through college

NOVEMBER, 1952 **Vol. 14, No. 7**

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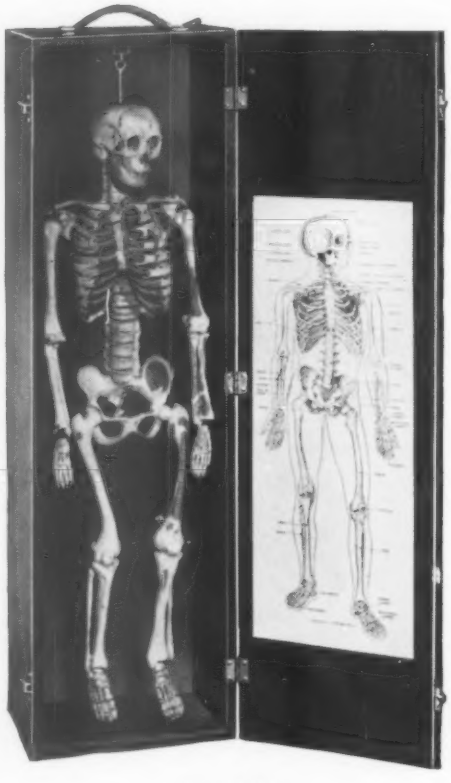

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THE AMERICAN BIOLOGY TEACHER

Publication of the National Association of Biology Teachers.

Issued monthly during the school year from October to May.

Publication Office—111 E. Chestnut St., Lancaster, Pa.

Editor-in-Chief—JOHN BREUKELMAN, State Teachers College, Emporia, Kan.

Managing Editor—MURIEL BEUSCHLEIN, 6431 S. Richmond, Chicago 29, Ill.

Subscriptions, renewals, and notices of change of address should be sent to the Secretary-Treasurer, John P. Harrold, 110 E. Hines Ave., Midland, Mich. Correspondence concerning advertising should be sent to the Managing Editor.

The entire Staff List will be found in the March and November issues.

Annual membership, including subscription, $2.50, outside United States, $3.00.

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THE COVER PICTURE was taken by Robert Stapleford, senior science student at The Kansas State Teachers College of Emporia, during a blood typing project conducted last year by the Emporia State chapter of *Beta Beta Beta*, national honorary biology fraternity. The picture was taken on Press Pan film with a 4×5 Speed Graphic camera, using a Press 40 flash bulb. Mr. Stapleford is now teaching science at Hoxie, Kansas.

The American Biology Teacher

Vol. 14 NOVEMBER, 1952 No. 7

Biology Majors and Industrial Biology

ROBERT L. GERING AND JOHN KLIEWER *
Bethel College, North Newton, Kansas

Two years ago the necessity for collecting specific information relative to vocational opportunities in the field of biology became sufficiently urgent in our department to warrant taking concerted action on the matter. Since then we have accumulated a sizable collection of pertinent data. Most of the material is widely scattered, but readily available for the asking. This information is being used extensively in our guidance program.

We soon discovered that information pertaining to vocational opportunities for biologists in industry was virtually nonexistent. The Biology Seminar (our local biology club) undertook the task of obtaining this information as an organizational project. A summary of the results of our "industrial survey" is presented here in the hope that this information might be of as much interest and value to other students and teachers as it has been to us.

A questionnaire, based on the questions most frequently asked by the students, was prepared and submitted to various industrial concerns. The mailing list was designed to sample a relatively wide range of activities. Firms located in twenty-four states and the Territory of Hawaii were included. Every section of the United States was represented except the relatively unindustrialized Southwest.

The reception of and the attitude toward our questionnaire was gratifying. One letter received from a representative of a prominent chemical manufacturer stated: "My feeling about this is that the greater the understanding and cooperation between industry and colleges, the better. Your questionnaire is a step in the right direction."

Of the 103 questionnaires sent out, 63 [61%] were returned. Questionnaires were sent to the following categories: (A) Biological supply houses; (B) Food processers [e.g., canners, packers, dairy and dairy product processers, millers, cereal processers]; (C) Pharmaceutical and chemical manufacturers; (D) Rubber processers; (E) Horticultural concerns; (F) Miscellaneous manufacturers

* Now at Department of Entomology, University of Utah, Salt Lake City, Utah.

[e.g., scientific equipment, household products, industrial materials and supplies, textiles, wood and wood products]; (G) Oil companies; (H) Importers and shippers; (I) Testing laboratories; and (J) Insurance companies.

I. Qualifications

The first section of the questionnaire dealt with the requisite qualifications for the prospective employee:

The necessity for at least a Bachelor's degree is emphatically indicated. Because of the technical nature of the work required in industry, there is an understandable predisposition toward technical training and its associated Bachelor of Science degree. This is further reflected by the number of chemical and pharmaceutical manufacturers specifying a Master's degree as the minimum educational requirement. Some explanation for the relatively high preference for the liberal arts degree by pharmaceutical manufacturers can be found in statements appended to the questionnaires. Personality, cooperation, and similar personal factors are emphasized as being nearly as important as formal education and training. A considerable number of companies train their own employees. Consequently a broad, general education might be as valuable as a highly specialized course of training.

A strikingly large and relatively uniform demand exists for training in bacteriology, mycology and biochemistry. Physiology, parasitology and entomology are in general demand; while botany, immunology, serology, vertebrate zoology and anatomy are less frequently demanded in certain categories. Because of the consistently large demand for bacteriology, mycology and biochemistry a number of our students have modified their courses of study. Our survey was not exhaustive, but even these limited data reveal some significant trends relative to requirements in the field of industrial biology.

None of the organizations contacted are currently using written examinations. One company, however, is initiating such a system.

The ages of 18 and 65–70 were given as the minimum and maximum age limits respectively by most concerns. It was generally emphasized that the maximum age limits are subject to reconsideration on the basis of individual cases. One return indicated a preference for "young, inexperienced college graduates." An unusual maximum age limit of 35 was cited by a number of companies where the nature of the work is vigorous and requires being out of doors much of the time.

Virtually all companies will employ either men or women. In the majority of instances there is no preference relative to marital status, although one return stated a preference for "single women, and married men."

A preference for specific state residents was indicated by only a few biological supply houses. Apparently the assumption is that people who live and are trained within the state generally are better acquainted with the local flora and fauna than those from other sections of the country.

While most firms have no specific citizenship requirements several indicated that American citizenship was necessary "particularly if there is a possibility of working on governmental orders." Several returns indicated that the applicant "must have at least his 'first papers,'" while another indicated that "communists and extreme socialists are not wanted. . . ." While only one firm indicated a limitation to "whites," it may be significant that 11% of those returning completed questionnaires failed to answer this specific question. A single firm indicated that preference was given to veterans, and then only "when all other factors are equal." Several returns stated that seniority with the firm was not lost by men who entered the service.

Approximately half of the returns indicated that a physical examination is required by the applicant. A number of those not requiring such an examination, however, do require a statement of physical fitness.

II. Nature of the Work

The second section of the questionnaire pertained to the nature of the work carried on by the firm insofar as it concerns the applicant:

In no instance was exclusive field work available. In half of the firms answering

only laboratory work is involved, while both field and laboratory work are combined in the remaining half. In most instances the work consists of both research and the application of standard, routine laboratory procedures. Exclusive research work is surprisingly limited. This fact was of particular interest to those of our students who anticipate research careers.

Only half of the companies encourage personal research. A gratifyingly high percentage of these, however, make available at least limited facilities for such personal research. There are few restrictions on the publication of results of personal research, even by those concerns which make available laboratory facilities for such research. The reasonable limitation of "subject to patent clearance" appears to be almost universal. Other limitations include "subject to the best interests of the company," or "subject to the approval of the supervisor."

Seasonal work is to be found only in concerns dealing with the collection of biological materials and in certain firms processing seasonal foods.

III. Organization

The last section of the questionnaire dealt with the organization and administration of the firms as it affects the applicant:

In no instance is union membership either required or encouraged. Sunday work is occasionally required by the majority of companies.

One year was stipulated as the minimum length of contract by a single firm. All other returns stated that contracts were either for "indefinite" periods, or that the companies concerned utilize "no contracts." Probationary periods ranging from one month to one year were indicated by several firms.

With a single exception vacations are granted with pay. Vacations, ranging from one to four weeks, frequently are dependent on length of service with the organization.

In most instances only the salary range for persons starting work with the firm was given. Salaries range from $2,000 to "exceeding $10,000 per year." The average initial pay for a biologist with a bachelor's degree exceeds $200 per month. Commissions were specifically mentioned only in a few returns.

Chances of promotion are good, except in one firm. A considerable number indicated, however, that such chances are "dependent," without stating what relevant factors are involved. The majority of companies base promotion on ability alone; the remaining companies consider both ability and seniority. No instance of promotion based on seniority alone was found.

Most firms encourage their employees to carry insurance. In fact, three companies furnish life insurance for their employees. In one of these concerns "each employee receives a free life insurance policy upon completion of 6 months' service." Two firms carry both health and accident policies for their employees. Group insurance is available in virtually all concerns, and is provided for their employees by several companies.

One firm provides housing facilities for its employees; a second indicated that it would provide such facilities if necessary. A third firm gives assistance in obtaining housing if necessary.

Foreign service is available only in a few large firms. Countries in which one can serve include Belgium, Brazil, Canada, Cuba, England, Haiti, Italy, Mexico, Puerto Rico, "South America" and Sweden. One return indicated that such openings are limited to "exceptional people only!"

Considerable interesting and valuable information was volunteered on the margins of the questionnaire, or in accompanying letters. Two groups of comments were particularly pertinent. Such factors as the "ability to cooperate," the ability to "follow instructions," a "pleasing personality," and "initiative" were frequently emphasized. Industry appears to be looking for "young people with new ideas." In the second group of comments the emphasis was placed on personal habits, including restrictions or prohibitions in regard to the use of tobacco and alcohol.

IV. Conclusions and Summary

Biologists are employed by a larger diversity of industrial concerns than is commonly realized. A college education is generally regarded as essential for prospective industrial biologists. Undue emphasis should not be placed on the Bachelor of Arts degree for prospective industrial biologists. Technical

training rather than a liberal arts education appears to be preferred generally by industry. Graduate work is universally recommended, but is actually required in only a few categories.

The almost universal demand for students having formal training in bacteriology, mycology and biochemistry appears to be an item of major importance for consideration when counseling biology majors. Physiology, parasitology and entomology are in relatively high demand. Age, sex, and marital status appear to be minor factors. Citizenship requirements are of concern only to our foreign students.

There appear to be relatively few opportunities involving full time field work; however, many positions involve both laboratory and field work. Full time research is relatively uncommon. There are few serious handicaps pertaining to personal research. The preponderance of work is continuous, although the type of work may vary markedly with the seasons in certain categories.

Union membership appears to be unimportant among industrial biologists. Sunday work is required occasionally by most firms. Contracts usually are granted for an indefinite period of time. Vacation with pay is virtually universal, although there is considerable difference as to the length of vacations. Salaries are dependent on training and experience. The average initial pay exceeds $200 per month. Chances of promotion are good. In most instances promotion is based largely on ability. Most firms encourage their employees to carry insurance. Group insurance is almost universally available. Housing facilities are rarely provided by the company. Foreign service appears to be available to qualified persons in a few large concerns. Personality, character, and initiative are emphasized in all categories.

A Blood Typing Project

As a class exercise in Biology we determined each pupil's blood type. The procedure was as follows: First, we sterilized the needle and the finger with alcohol on sterile cotton. A drop of *anti B* serum was placed at the left end of a clean slide and a drop of *anti A* serum at the right. A drop of a pupil's blood was mixed with each of the serums separately. The slide was then placed under a microscope to determine if agglutination had occurred.

Clumping of the red blood cells together in the process of agglutination is caused by agglutinins. One of the photographs shows agglutination of the cells and the other shows a lack of it.

The blood group to which the pupil belongs was revealed as follows: If agglutination occurred in the *anti A* serum only, the blood group was B. If it occurred in the *anti B* serum only, the blood type was A. If agglutination occurred in both, the blood group was AB. Those in this group can receive blood from any group and are known as universal recipients. Those whose blood was not agglutinated by either serum belong to group O. These are universal donors because they can give blood to any group.

Our class results were compared to United States averages as follows:

	Group O	Group A	Group B	Group AB
Class result	52%	38%	9%	1%
U. S. Ave.	45%	42%	10%	3%

In these times of crisis and wars every individual should know what his or her blood type is. In case of an A-bomb attack, if this information is known and tattooed on each person's body, quick transfusions can be made although cross-typing would still be desirable. If such an attack came without warning and there wasn't time for cross-matching, blood serum could be used while it lasted, and then they would need to use whole blood directly.

The Rh factor would need to be known also. Another article will tell how we determined these for the pupils in our class.

SHIRLEY SORENSON,
Roosevelt High School,
Cedar Rapids, Iowa

The Rh-Factor

"The Rh-factor is a substance present in the red blood cells of most, but not all, persons; those who have it are said to be Rh-positive, those who do not, Rh-negative. It is an antigen to the Rh-negative person." *

In our class we made the Rh-test and found 76 per cent of the pupils Rh-positive. In the United States approximately 85 per cent of the people are Rh-positive and 15 per cent are Rh-negative.

When I was participating in determining the rest of the students' Rh-factors, my materials were:

A. Alcohol and cotton for the cleansing of the finger
B. A lancet for pricking the finger
C. Anti-Rh serum
D. Student's blood on a slide
E. Microscope

I placed a drop of serum on the slide and then a drop of blood on the serum and mixed them together. When they were thoroughly mixed I placed the slide over heat for two minutes, or until it began to agglutinate. If agglutination can be seen without the aid of a microscope, this is definite proof that the person is Rh-positive. If no agglutination occurs, the person is Rh-negative. It is always best to check under the microscope, as agglutination is not always visible to the naked eye.

The effect that the Rh-factor has on babies was startling to the girls. Those who were Rh-negative were particularly concerned. The negative girls went searching through the Rh-factor tests results to find the negative boys.

If an Rh-negative woman marries an Rh-positive man, it is very possible that this will have an effect on their children. The first child, being all right in itself, causes antigens to be produced in the mother's blood. These antigens will destroy the red blood cells in future babies, causing them to be born with anemia. However, the hospitals and doctors have learned to cope with this problem. They drain off a new-born baby's blood and provide the baby with a new blood supply.

If both parents, however, are Rh-negative or both Rh-positive, there will be no effect on either mother or child.

KAY HERRBACH,
Roosevelt High School,
Cedar Rapids, Iowa

Are You Anemic?

What is your hemoglobin count?

To take my hemoglobin count I used a lancet to obtain a drop of blood and let it drop on white test paper. Then I compared the partly dry spot with the color chart. The average for men is considered as 95% and for women it is 85%.

* *Exploring Biology*, by Ella Thea Smith, p. 578.

I also did the test on seventy-nine Biology classmates age fifteen to sixteen. The results were as follows:

Girls	Per cent	Boys	Per cent
2	90%	4	95%
1	87%	9	90%
14	85%	13	85%
17	80%	5	80%
6	75%	1	75%
1	60%		

These results show a decided tendency toward a slight anemia in more than half of the sophomores tested during the winter months.

We used the Tallquis Hemoglobin test which may be bought at any pharmacy or drug store for one dollar.

When taking this test I sometimes had difficulty of getting a good size drop of blood. I also found that I needed plenty of light to make an accurate reading.

Olga Jiroutek,
Roosevelt High School,
Cedar Rapids, Iowa

Misses Sorenson, Herrbach and Jiroutek are pupils of S. M. Pattee, Roosevelt High School biology teacher, who has made frequent contributions to *The American Biology Teacher.*

The Conservation Project of The National Association of Biology Teachers

Richard L. Weaver, Project Leader
School of Natural Resources, University of Michigan, Ann Arbor

The National Conservation Project launched last year by The National Association of Biology Teachers has received the wholehearted support of all the people who have considered it and over thirty national conservation organizations have endorsed it and their representatives are serving on the Advisory Committee for the Project.

There are two distinct objectives to the project: (1) to encourage as many biology teachers as possible to engage in some conservation teaching, and (2) to obtain descriptions of the outstanding techniques used, for publication in a series of leaflets on conservation teaching.

In order to help biology teachers understand the type of activities deemed most helpful in teaching conservation, a set of criteria with illustrated examples has been prepared in a series of national and state meetings. These Criteria have been published and distributed, and are printed below. Anyone interested in helping with the project can obtain copies from the project leader.

Meetings of state and other groups will be held as frequently as necessary, and wherever feasible to assist in the development of plans and the promotion of the project. The grant-in-aid of $10,000 made by The American Nature Association, is being used to underwrite the expenses of state committee work, regional and national meetings and work conferences. Several states, including Indiana, North Carolina and Tennessee, have received additional grants from the National Wildlife Federation, which will facilitate their state plans.

National Association of Biology Teachers
CONSERVATION PROJECT

To help increase the effectiveness of conservation and resource-use teaching by biology teachers

The three-year conservation project has been developed by the National Association of Biology Teachers, with the help of a grant-in-aid from the American Nature Association. The project is designed to develop and promote the acceptance of a set of criteria or objectives, which can be documented by actual illustrations of good teaching techniques particularly by biology teachers, and which can be used to stimulate many more teachers to increase the emphasis on conservation.

Committees are organized in each state to activate and conduct the project. State committee meetings, and state and regional work conferences will be organized in cooperation and in conjunction with meetings of other professional groups to prepare plans, screen and edit materials and to initiate new activities. All biology teachers and others interested in helping with the project are urged to contact the Project Leader, or the state and regional chairmen, or members of the Executive Committee, listed on the back of this letter.

References

We recommend the use of four specific new yearbooks and manuals, along with the numerous national texts and references on conservation listed in their bibliographies, to state committees and schools desirous of establishing sound definitions and programs in conservation education. They are:

1. **Conservation Education in American Schools** by the American Association of School Administrators, 1201 16th Street, N.W., Washington 6, D. C. 1951. 527 pages. **$4.00.** See pages **61–74** Guides for School Programs in Conservation Education. Pages **229–252** Administrative Leadership.
2. **Large Was Our Bounty,** Natural Resources and the Schools, by the Association for Supervision and Curriculum Development, 1948 Yearbook, 1201 16th Street, N.W., Washington **6**, D. C. 216 pages, **$2.50.** See pages **44–68** What Principles Shall Guide Us.
3. **Learning by Living,** Education for Wise Use of Resources, by Southern States Work Conference and Committee on Southern Regional Studies and Education. (Order from State Department of Education, Tallahassee, Florida.) **1950**, 122 pages, **50¢.**
4. **Guide to Resource-Use Education Workshops,** American Council on Education and Committee on Southern Regional Studies on Education, 1785 Mass. Avenue, N.W., Washington 6, D. C. 1951. **50¢.**

Use of Criteria

We recommend the following criteria as guides in:

- Locating outstanding conservation teaching by **biology teachers.**
- Securing examples of techniques and good teaching practices which will illustrate one or more of the criteria.
- Preparing descriptions of the examples suggested or of comparable ones, to publish and share with other interested teachers.
- Stimulating greater emphasis on conservation in biology programs.

If you have completed one or more examples which will illustrate any of the criteria, prepare your description as indicated in the following instructions. If you have not as yet completed any conservation activities but would like to do so, we suggest that you experiment with one or more

of the projects or techniques suggested and report your results to the committee for possible publication. Send such descriptions to your state chairmen or to **RICHARD L. WEAVER, Project Leader, School of Natural Resources, University of Michigan, Ann Arbor.**

Criteria for Conservation Teaching in Biology

prepared for use in the

Conservation Project of the National Association of Biology Teachers

A. Conservation Education includes and shows the relationships of the natural, human, social and economic resources. The biology teacher is particularly responsible for instruction in techniques and information related to the wise use of the natural resources.

1. The biology class arranged a panel of representatives of resource agencies to show how each agency was concerned with the problem of stream pollution in a city.
2. Data were obtained by the biology classes resulting from soil tests and observations of animals showing results of mineral deficiencies in the soils of a county.
3. Biology students compared an area reforested and planted with wildlife cover with one not improved to record the increase in wildlife and the decrease in soil erosion.
4. Data were obtained which showed the detrimental effects of too much drainage on wildlife populations and on the lowering of the water table in certain parts of the state.
5. The biology students compared the land use practices and the population changes in their county with another dissimilar county in the state to show the value of good conservation farming.
6. The biology students studied the subdivision of the city in which they lived to see if the space was being used most efficiently, if the various wastes were disposed properly, if blighted areas could be reclaimed and if soils need special treatment for vegetables and flowers.

B. Conservation Education is an integral part of the curriculum. The biology teacher shares responsibility for a large part of the conservation emphasis and seeks to integrate biological information with the activities of other subjects and appropriate extra-class activities.

1. The biology and vocational agriculture classes cooperated in planting a windbreak around the school grounds.
2. The biology and home economics classes developed a rooting bed for shrubs and flowers to be used in landscaping the school and the homes of interested students.
3. The biology classes assisted the Junior Bird Club in the Fifth Grade in establishing a wildlife sanctuary near the school.
4. The biology club set up a wildlife display in the Science Fair at school and at the county fair.
5. The biology class cooperated with the history class in developing a local history of the way the natural resources had been used in the area since its settlement.

C. Conservation Education is fitted to the experiences, needs, and interests of the pupils. Biological interests which are stimulated by out-of-school activities are used in the school program and the conservation activities within the school are directed so as to carry over into out-of-school activities.

1. Pupils designed specific methods for the control of insects in their own gardens.
2. Pupils demonstrated approved methods of trapping, fishing, hunting, and camping.
3. Pupils were assisted by the biology teacher in preparing for the conservation merit badge in Scouting, as a part of the biology course.
4. Biology pupils in the photography club prepared an exhibit for the school on plants attractive to birds in their locality.
5. Pupils organized themselves into small groups to work on units in conservation of their own choice and shared their findings with the other groups.

D. Conservation education develops proper attitudes toward the wisest use of all resources. Correct conservation attitudes are incorporated and allied with other character-building and citizenship efforts.

1. Members of the biology class were instrumental in getting a number of boys to stop shooting song birds with BB guns, by interesting them in "shooting them" with cameras.
2. The biology class organized a forestry patrol for planting trees and putting out forest fires in the area.

3. The biology class worked with the student council in maintaining attractively landscaped schoolgrounds, encouraging plantings, and protecting trees and shrubs.
4. The biology students participated with students in social studies in a series of symposia and discussions on private enterprise vs. public interest in resource development.
5. The biology class provided the necessary biological information to help the civics class in making a safety map and plan for the city, which was accepted and used by the student council.

E. **Conservation education provides pupils with information about careers in conservation and provides stimulating work experiences and contacts with professional conservationists.**

1. The biology class regularly visits farms, state parks, forests and fish hatcheries, to study the conservation practices and to assist locally in tree planting, fish stocking, or running lines for terraces.
2. The biology classes spent a week at a school camp in a state park, studied and worked with professional conservationists on conservation projects.
3. The biology students cooperated in planning and conducting a career day sponsored by the guidance office.
4. The county forester, soil conservationist, wildlife technician and a local nurseryman were used as consultants in developing plans for making the schoolgrounds an outdoor teaching laboratory.
5. Students made a survey of the professional opportunities in teaching conservation, in nature writing and photography, and in school or private camp work.

F. **Conservation education is a cooperative enterprise between school and community, bringing about a better understanding of resource problems and developing plans for the solution of them.**

1. The biology class assisted the health department in a survey and control of mosquito breeding areas, in and near the city.
2. The biology class worked with the health classes in a survey of hook worm infestation in the county and helped the health department in its educational program on elimination of the causes.
3. The biology class gathered all available information on the best agricultural practices for the county and dramatized the effects of one-crop farming and the need for diversification and soil conservation at a series of community gatherings.
4. The biology students developed a testing service for seed germination and soil acidity for the families served by the school.
5. The biology classes helped the state conservation officials locate abandoned mines which needed sealing to protect the local streams.
6. The biology class assisted town officials in developing an area for a community park, a nature trail, a wildlife sanctuary.
7. The biology class studied stream pollution and solicited the interest of the community in control measures to make the stream fit for recreational use.
8. The biology class demonstrated on the school property how to utilize leaves from city streets, garden wastes and garbage from the cafeteria in making mulch.
9. The biology students made block surveys in the city to determine the shade tree needs and assisted town officials in planting suitable varieties.

G. **Conservation education is well-balanced with respect to content.** It embraces a broad consideration of the biological interrelations which exist among wildlife, water, forests, grasslands, wastelands, soil, minerals and people.

1. The biology classes developed and used a portion of the school ground or a school or town forest as an area to observe ecological succession in nature, and to determine the types of management practices needed to conserve certain aspects of the environment. They developed a nature trail in it for the use of all students and parents.
2. The biology students prepared maps, pictures, and models illustrating good and poor conservation practices in the county and displayed them for civic groups, clubs and P.T.A.'s.
3. The pupils prepared graphs and charts to show the good and bad effects of local industries in the area.
4. The biology class made a comparison of self-sufficient farming versus commercial or one-crop farming.
5. The biology class developed plans for reclaiming blighted areas nearby.

H. **Conservation is taught as a science and biological research provides the data for development of conservation plans and procedures.** This scientific information is translated into social action, as good conservation is improved behavior.

1. Biology students helped identify local conservation problems, determined the causes scientifically and through controlled experiments developed suitable plans for their solution.
2. Soil tests, population counts of plants and animals were made on areas under different management plans to show the effects of over-grazing, one-crop farming, improper forest cutting as contrasted to the best practices.
3. The students grew seedlings in soil or water of different mineral deficiencies and then compared their results with soil tests of neighborhood soils.
4. The biology class experimented with earthworm cultures and compared their results with population counts of earthworms in local soils.

I. **Conservation education begins at home but eventually includes the problems, the developmental plans and proper attitudes and habits applicable to the county, state region, nation and the world.**

1. The students traced the historical, agricultural, and industrial development of the county and state and correlated those with the reduction or proper maintenance of the natural resources.
2. The biology class cooperated with the social study classes in providing information as to the contributions of biology in the Point Four program.
3. The biology students arranged for panels and discussion groups of representatives of different countries to gain a better understanding of the mutual resource problems.
4. The biology students analyzed the causes of the dust bowl, the effects of the cotton and tobacco economy in the South, and the values of the national parks.

J. **The best existing textbooks, pamphlets, films, recordings and other instructional aids are utilized but an attempt is also made to develop materials that are adapted to the communities own environment and resources.**

1. A series of slides and movies were developed which illustrated the most important local resource problems and showed suggested solutions.
2. Arrangements were made and a list compiled of places to go in the county where different things could be studied and photographed, and where field trips could be conducted.

K. **Conservation applies to all people, rural and urban and to be most effective a common viewpoint with respect to resource use should be established which shows the interdependence of all groups.**

1. The biology classes worked with the agricultural classes and FFA clubs in dramatizing the close relationship of rural and urban development to better roads, more markets, more employment, better health and better schools.
2. The biology class sponsored a conservation fair which was participated in by all the schools in the city and county showing the results of conservation projects and activities in all the schools.
3. The biology class found suitable plots in the city where experimental work on vegetables, flowers, and shrubs could be conducted and proper uses demonstrated for various fertilizers, insecticides, and weed killers.
4. The biology class conducted a metal scrap recovery project to help raise funds for a community center.
5. The biology students made a study of the money spent in cities by rural people and the money invested and spent in the county by city people, to show the interdependence of rural and urban areas.
6. The biology students interviewed bank officials and farm loan agencies to see how improved land use practices are encouraged by loans.
7. A wildlife club was organized in the city to assist farmers in the area with wildlife improvements and proper hunting practices.

Instructions to Teachers for Preparing Descriptions of Techniques

Some teachers and schools will have conducted more than one project or activity. However it will be helpful to the editing committees if each project, activity or technique is described separately. In these descriptions, the following things should be included.

1. With which group, in which school and during what period of time was it used?
2. How the particular activity, project or technique originated and the part the students, parents, and community leaders had in planning it?
3. How the work was organized, the people who assisted in the execution of it, and the way the students and other classes shared in it?
4. Which particular resource problem or conservation attitudes were stressed in the development of the work?

5. How the work was evaluated and what tangible results could be observed or recorded?
6. Other things which you consider important.
7. Pictures and charts or graphs should be included with the description wherever possible.

Send the descriptions to the state chairman. A list of these was published in the May issue (page 115) and a revised list will be printed in an early issue.

AN APOLOGY is in order, to the Project Leader and others in charge of the Conservation Project, for the failure of *The American Biology Teacher* to print the foregoing in the October Issue. By one of those switches explainable only as some sort of lapse, the material was filed in the November folder instead of the October and discovered too late to make the correction. It should by all means have appeared as near as possible to the beginning of the school year.

JOHN BREUKELMAN

What to Look for in a Science Teacher

B. H. CARLETON
Zoology Department, University of Portland, Portland, Oregon

Our publications are so well supplied with articles on science teaching that nothing further would seem possible on the subject. Strangely enough, almost nothing has been written on the real reasons why administrators choose teachers; no one, apparently, has cared to write much about the actual reasons for failure and success in science teaching.

The question "What is a good teacher?" when asked over forty years ago in Oregon, gradually developed one of the first rural-school standardization programs in the United States, conducted at the outset by H. C. Seymour with the cooperation of J. H. Ackerman, Oregon Normal School's President at that time.

It would seem profitable, therefore, to inquire as to the nature of successful science teaching, if for no other reason than to advise prospective science teachers.

"Other things being equal, character is decisive," one eminently successful scientist and science teacher has observed.

The type of person suitable for science teaching cannot be described by a list of desirable attributes because it is conceivable that the list could be fulfilled by a person entirely unsuited to the endeavor. Certain minima are taken for granted, such as knowledge of the subject, technical ability to teach effectively, and a suitable personality. None of these three needs further belaboring. It is presumed that no one with serious defects, such as dishonesty, lack of personal integrity, or antagonism toward students, could obtain sufficient recommendations for serious consideration by any administrator.

Someone should, however, advise prospective teachers of the real problems they will meet, and perhaps indicate how administrators would like to have them solved. In the first place, the welfare and good of the entire school must be placed foremost. It is not enough that a teacher develops his own students, conducts his classes well, or makes a fine impression at meetings with parents. Schools and universities are similar to delicate flowers—they can grow and bloom with careful attention, or they can wilt and sour from neglect or dissension.

The teacher who merely attempts to demonstrate his own knowledge and political wisdom for his own advancement distresses his administrator, since integration is hampered.

There are marks and signs of the amateur science teacher well known in the field of science. Such a beginner is

likely to make definite errors. He may and often does attempt to reproduce his college science course. He may, perhaps from defensive fear, attempt to demonstrate his own knowledge of his subject, leaving his students far behind. He will often blame his failures on equipment, on lack of facilities, or other physical shortcomings of his school. Sometimes he will openly point to shortcomings in other teachers, forgetting, for the time being, his own vulnerability. Now and then a new teacher will even challenge administrative methods in his school, failing to recognize the administrative experience of his superiors.

Successful science teachers have one thing in common—kindness. There are few subjects susceptible of unkind methods more than the sciences. Kindness is not measured by the immediate method used, but instead by the underlying intention of the teacher. A gruff, difficult taskmaster often impresses the students more than the lazy teacher unwilling to work himself or his students. Curiously, the underlying and real attitude of the teacher transmits itself directly to the students—they know the difference between sentimental laziness, and fundamental kindness which is solicitous of the ultimate good of the student.

A great deal has been written about the difficult terminology and subject matter found in some science courses, but certain courses now offered in high schools and colleges are highly popular though well within the description of "technical." The criticism has developed because of very poor teaching, rather than because of the nature of the subject matter offered.

In many areas over the United States certain texts or certain state-wide courses are demanded. In some cases the teachers handling the material do not themselves understand the course they attempt to teach. It is just as simple to teach a Latin name in a science course as in a Latin course, provided the teacher understands the meaning of the word offered. Latin is taken for granted in ninth grade classes in all cities. Some of this condition has appeared because untrained teachers have often been assigned to biology courses.

The successful science teacher must know the subject before he can himself assimilate it, summarize it, and produce a coherent and understandable account. This explains the fact that many of the world's greatest scientists have had great success in teaching small children.

The biology teacher is especially simple to judge because the immediate environment of any school provides a trained teacher ample material and supplies for most of his work. The untrained teacher, often promoted from a grade school position to "handle biology," frequently writes out a list of materials he thinks necessary from a supply house. In specific instances the materials requested were to be found within a mile of the teacher's school at spots frequented by collectors and biologists of the region. A case is known of a teacher, situated at the seashore—perhaps the best possible biology laboratory—who wrote and asked for help because her "textbooks were delayed."

Nevertheless, these are small factors compared to that of the character of the person who is to do the teaching. There are three important factors involved: (1) The ultimate aim of the teacher; (2) the kindness of the teacher (the teacher is either on "our side" or not, students feel); and (3) the total effect of the teacher's presence on the school as a whole.

The ultimate aim of the teacher is usually decided by the ideals and purposes of the teacher himself. The kindness of the teacher must be measured in

long-range terms—what the student thinks of the teacher five or even ten years later, and the total effect of the teacher on the school is probably the most decisive point of concern to the administrator.

No matter how much science a teacher might know, how many methods he may command to teach what he knows, the teacher whose total effect on his school is negative must be removed. On the other hand, that teacher who brings respect and encouragement to his school from its patrons is the teacher who will remain in the profession.

These observations are submitted for very real reasons: Only a few days ago a highly successful teacher asked of me, "Why do they keep me?" The principal of his school had never answered that question, although the teacher's tenure has been long and not due to legal tenure rules. The reasons he is kept are that he is thoroughly conversant with his subject, students say of him, "He is the kindest man I ever met," and he has brought both respect and encouragement to his school.

THE ST. LOUIS MEETING

At the time of going to press the details of the St. Louis meeting of THE NATIONAL ASSOCIATION OF BIOLOGY TEACHERS, held in conjunction with the annual meeting of The American Association for the Advancement of Science, December 27 to 29, were not sufficiently complete or definite to permit printing the entire program in this issue. The detailed program will appear in the December issue.

As in previous years the program will be a joint affair, the cooperating societies being The American Nature Study Society, The National Science Teachers Association and The National Association of Biology Teachers. Some of the programs will be joint sessions of the three societies and some of them will be meetings of the individual societies.

The list of hotels, together with a hotel reservation coupon, was printed on page 156 of the October issue.

One of the most important issues to be discussed in the business sessions of NABT will be the proposed membership of NABT in the American Institute of Biological Sciences. Representatives of both bodies met at Cornell University September 10, to explore the possibilities of the two associations working together for mutual benefit. (AIBS is an association of *societies*, i.e., individuals do not belong to AIBS, but societies do; therefore the question is whether NABT, as a society, should become affiliated with AIBS.)

The American Institute of Biological Sciences has three types of group affiliation: (1) *Member Societies* (of which there are 18) paying maximum dues of $1,000 annually; (2) *Affiliate Societies* (of which there are 6) paying dues of $100; (3) *Associates* (of which there are 14), which are not eligible to membership but serve biological sciences in some way, such as a book company.

Space does not permit a complete listing of the advantages of full membership, but some of them follow:

1. Each of our 2200 members would receive the AIBS *Bulletin*, issued 5 times a year, and costing non-members $2.00 a year.
2. The AIBS office would perform certain services, e.g., addressograph filing, at a reduced cost.
3. The AIBS operates a placement service, at no charge to members of member societies.
4. Arrangements can be worked out whereby members of the AIBS office staff can be assigned to NABT for certain duties.
5. Membership in AIBS would help to overcome the present tendency among professional biologists to "look down" on biology teachers.

There are two obvious disadvantages:

(1) Thus far the dates of the AIBS meetings have come early in September, when high school teachers have already started work. However, the future plans of AIBS call for meetings the last week in August.

(2) The $1,000 dues is a formidable figure to an association such as ours. The question is whether the membership in AIBS would lead to an increase in membership to compensate for the loss in membership that might result from the increase of 50¢ involved in joining AIBS.

Some other important decisions to be made involve the format and arrangements of *The American Biology Teacher*. Some of the changes proposed at the Chicago meeting last summer have been made, but some others are under consideration. Many of these will be discussed in the December issue.

Cytology for Schools?

G. W. SHAW
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May I make a plea for cytology? This is a topic which, in the past, has been very much neglected in high school and even in college biology courses. Now that its practical applications to agriculture, horticulture, medicine, etc., have been fully appreciated, it is surely time that more attention is devoted to cytology. Generally speaking, the examination of a prepared slide—usually a longitudinal section of *Allium* root—has had to suffice, and little or no attempt has been made to demonstrate the chromosomes of a growing plant or animal. The reasons for this state of affairs have no doubt been a lack of suitable techniques on the part of the teacher, and the almost complete absence of suggested methods in school textbooks. By removing the second of these obstacles, the first should automatically right itself. The chromosomes of plants and animals can be easily demonstrated, and require no special skill or apparatus. Materials and methods are outlined below.

Materials

Stages in mitosis are to be found in the growing tips of most roots, and are seen particularly well in the starch-free roots of most monocotyledons. The bulbs of *Allium* can be induced to form roots by setting them on the tops of glass jars, with their bases in water. Roots appear in 10 to 14 days. Cuttings of *Tradescantia* also form adventitious roots in water. Both of these plants have large and easily-stainable chromosomes. Germinating peas, beans and other seeds can be used, but the results are not quite so good. For meiosis in plants, we must examine the young anthers present in very early flower buds. A series of buds, from the smallest to the almost open flower, can be used to build up a complete set of stages from early leptotene to tetrad formation, and even to the haploid pollen grain mitosis. This last stage is often overlooked, although it gives a particularly clear picture of mitosis since, as a rule, a relatively small number of chromosomes is involved.

For animal chromosomes we can examine the testes either as smears or sections and, if taken some time before the breeding season when sperm formation is at its peak, many stages are often to be found. For the beginner, grasshopper testes are eminently suitable. The testes should be dissected out about July, or even later if possible, and fixed or stained as directed below. The salivary glands of certain insect larvae, notably the fruit-fly *Drosophila*, provide interesting material in the giant banded chromosomes. These are said to represent nuclei in a permanent prophase, and are so large as to be visible with a good hand-lens. Old larvae should be taken, and the head removed under water. If the animal is now squeezed, the salivary glands will float out as a pair of flat, oval-shaped bodies. These can be fixed, stained, and mounted for examination.

Methods

Temporary and permanent mounts can be made and, if time is available, both should be tried. Permanent mounts involve:

(a) Fixation for several hours in a suitable fixative. (b) Embedding in

paraffin wax, followed by microtome sectioning, or alternatively smeared. (c) Staining and mounting.

Before fixing roots, anthers, or testes for permanent mounts, a rapid diagnosis of the stages in mitosis or meiosis present can be made from a temporary smear, using one of the following combined stain-fixatives: (a) Acetocarmine. This is prepared by refluxing 1 gm. powdered carmine with 200 cc. of 45% acetic acid for about 20 min. With some tissues, iron-acetocarmine (prepared by adding 1 drop $FeCl_3$ Sol. to above stain) gives better results. (b) Aceto-orcein (1% orcein in 45% acetic acid). This gives particularly good results with animal tissue. (c) Methyl green acetic. (d) Bismark brown acetic.

In making a temporary mount, the root tip, anther, or fragment of testes is placed on a slide in a drop of stain-fixative and gently tapped until the cells separate. An old toothbrush handle, with the end polished, makes a useful tool for this purpose. Staining can often be assisted by gentle warming over a spirit lamp. More stain should then be added and the cover slip applied. Such a preparation will last a few hours only, but methods have been devised for making it permanent. A good method recommended by Darlington and La Cour (1) is as follows: Leave the slide in a Petri-dish containing 10% acetic acid until the cover slip separates from the slide. Then pass the slide and cover slip through a mixture of 1 part acetic acid to 3 parts absolute alcohol, add a drop of "Euparal," and replace the cover slip. The edge of the cover slip should be ringed with cement.

Permanent Methods

There are three main methods for dealing with permanent chromosome preparations: (a) the Feulgen Reaction; (b) iron haematoxylin; and (c) gentian violet. The Feulgen Reaction gives brilliant preparations, but it may be necessary to try several samples of stain before good results are obtained.

To use the Feulgen method, fix material in acetic alcohol for ½ to several hours; then hydrolyze in normal hydrochloric acid at 60° C. for several minutes, usually about 10 min. The acid used in this process also dissolves the calcium pectate of the middle lamellae in plant cells, thus causing the cells to separate in the next operation, which is to tap out the material with the instrument described earlier. When a thin smear of cells has been obtained, the slide is again gently warmed to stick the material to the slide. Great care must be taken to ensure that the smear does not dry out too much. Next transfer the slide to a stain jar or wide tube containing the Feulgen stain (leucobasic fuchsin). The materials should be allowed to stain for several hours and can be examined at intervals under the microscope, if required. Wash in distilled water, and dehydrate in the usual way. From absolute alcohol, mount in "Euparal." An alternative method is to hydrolyze in small tubes, decant off the acid, and add the stain to the tube, thus staining the tissue in bulk. Afterwards, "squash" the tissue. With the last method, however, one cannot tell the intensity of the stain, and a process of trial and error must be employed.

For the iron haematoxylin method, the material must be mordanted in 4% potash-alum Sol. (15 min.) washed in water, stained in a good sample of haematoxylin (0.5%)—the length of the staining depending on the material—blued in alkaline water, dehydrated with alcohol, cleared in xylene, and mounted in balsam. The third staining method, using gentian violet, has always been popular. The time taken to make a

preparation with this stain is considerably less than with other stains, and the result is more pleasing to the eye. Gentian violet is used as a 1% Sol. in water, smears and sections being stained for about 5 min., followed by a rinse in water. Due to its extreme solubility in alcohol, dehydrating often proves a tricky task, and a method has been introduced (2) employing "Cellosolve" as the dehydrating agent, which overcomes the difficulty to a certain extent. Pass the slides through two changes of "Cellosolve" into xylene, leave for several minutes, and mount in balsam. A trace of light green powder in the first "Cellosolve" makes a beautiful preparation of purple chromosomes in green cytoplasm. For school use, the last method can be recommended as giving as clear a picture of chromosomes as it is possible to obtain. More technical methods are to be found in Bolles Lee (3), Baker (4), etc., but are not so suitable for the beginner.

References

1. Darlington and La Cour. 1947. "The Handling of Chromosomes" (Allen and Unwin).
2. Shaw, G. W. 1950. Nature. Vol. 165, P. 408.
3. Bolles Lee. 1950. "The Microtomists' Vade-Mecum" (Churchill).
4. Baker, J. 1945. "Cytological Technique" (Methuen).

Proposed Amendments to the Constitution and By-laws

As announced on page 155 of the October issue, the details of the proposed constitutional revisions are presented below. In the left hand column is the present form of those sections in which changes are proposed; the right hand column presents the form as it will be if the proposed changes are approved at the St. Louis meeting.

Present Form

Article IV

Officers and Governing Boards

Section 1. The officers of this Association shall consist of a president, president elect, first vice-president, second vice-president, secretary-treasurer, and the immediate past president.

Section 2. The executive board shall consist of the president, president-elect, first vice-president, second vice-president, secretary-treasurer, immediate past president, editor-in-chief of the journal and managing editor of the journal.

Section 3. The representative assembly shall be composed of the executive board, associate editors of the journal, all past presidents, a delegate from each affiliated local association and members of the national membership committee.

Proposed Amendments

Article IV

Officers and Governing Boards

Section 1. *Executive Officers.* The executive officers of this Association shall consist of the immediate past president, president, president-elect, first vice-president, second vice-president, and secretary-treasurer.

Section 2. *Term of Office.* The term of office shall be for a period of one year. No office except the office of the secretary-treasurer, shall be held by the same person for more than five terms.

Section 3. *Executive Board.* This board shall consist of the executive officers, the editor-in-chief of the journal and the managing editor of the journal.

Section 4. *Functions of Executive Board.* The function of the executive board shall be to transact the business of the Association which cannot be postponed until the next meeting of the Board of Directors. The executive board shall be empowered to adjust

Section 4. The executive board shall be empowered to adjust the amount of membership dues as necessary to cover cost of the journal and the operation of the Association.

ARTICLE V

Meetings

Section 1. Sectional or regional meetings may be called by a 5/8 vote of the executive board.

Section 2. The annual meeting will be held in conjunction with the winter meeting of the AAAS.

ARTICLE VI

Amendments

Section 1 (in part). Such proposed amendments shall also require a favorable vote of four-fifths (4/5) of the Executive Board.

the amount of membership dues as necessary to cover the cost of the journal and the operation of the Association.

Section 5. *Board of Directors.* The Board of Directors shall consist of the executive board of the Association, members of the editorial board, members of the advisory board, all past presidents, one or more delegates, based on membership, from each affiliated local association, chairmen of all permanent and standing committees, regional chairmen and members-at-large elected by the Board of Directors.

Section 6. *Functions of the Board of Directors.* The Board of Directors shall be the official governing body of the Association and shall convene at the time specified for the business meetings of the Association.

Section 7. *Regional Chairmen.* These chairmen shall be recommended by the Executive Board and approved by the Board of Directors. The number and term of office shall be decided by the executive board. Such chairmen shall assist the executive board in organizing state committees, holding regional conferences and meetings, and in promoting membership in the Association.

ARTICLE V

Meetings

Section 1. There shall be an annual national meeting of the Association. Additional national or regional meetings may be called by a 5/8 majority vote of all members of the executive board or Board of Directors in session or by mail.

Section 2. The annual meeting of the Association shall be held in conjunction with the winter meeting of the American Association for the Advancement of Science when possible, or at such other time and place as shall be set by a five-eighths (5/8) majority vote of the executive board or Board of Directors. The exact time and length of such meeting shall be specified by the president together with reasons for its proposal before a vote is taken. No meeting may be held less than one month after being announced in a number of the journal, official publication of the Association. One or more of the sessions of the annual meeting must be devoted to the business of the Association by the Board of Directors.

ARTICLE VI

Amendments

Section 1 (in part). Passage of such proposed amendments shall require a favorable vote of at least two-thirds (2/3) of the members present and voting.

By-Laws

Article I

Section 1. The term of office shall be for a period of one year. No office shall be held by the same person for more than five terms except the office of secretary-treasurer.

Section 2. The president shall preside at all meetings of the Association and the executive board. He shall appoint, subject to the approval of the board, all committees not provided for otherwise. He shall be an ex-officio member of these committees. He shall sign with the secretary-treasurer all vouchers drawn upon the treasury. He shall in every way endeavor to promote the interest of the Association.

Section 3. The president-elect shall assume all duties of the president in case of the absence of the president. The president-elect shall succeed to the office of president the following year.

Section 4. The duties of the vice-presidents shall be to aid the president. They shall assist the president in the furtherance of the work and the progress of the Association.

Section 5. The secretary-treasurer shall keep a permanent accurate record of the proceedings of each of the meetings of the Association and the executive board. He shall keep on file a correct list of the members of the Association, their mailing addresses and a statement of their standing. He shall assist the president in carrying on the correspondence of the Association. He shall keep an itemized account of all receipts and expenditures and make a written report of the same to the membership regularly. The books shall be audited by a certified public accountant or by a special committee of three members, no one of which is a member of the executive board.

Article II

Nomination and Election of Officers

Section 2. Additional nominations may be

By-Laws

Article I

Duties of Officers

Section 1. The president shall preside at all business meetings of the Association and have charge of the business session of the executive board. He shall appoint, subject to approval of the executive board, all committees not otherwise provided for. He shall be an ex-officio member of those committees. He shall sign with the secretary-treasurer all vouchers drawn upon the treasury. He shall in every way endeavor to promote the interests of the Association. He shall prepare and submit to members of the executive board prior to the annual meeting the agenda of the business to be considered at the annual business meeting. He shall also announce the time for each of the general and business sessions of the annual meeting in an early fall issue of the journal. He shall appoint a committee on local arrangements for the annual meeting.

Section 2. The president-elect shall assume all duties of the president in case of the absence of the president. The president-elect shall succeed to the office of the president the following year. The president-elect shall be responsible for the preparing of the program of the general meeting to be held at the annual meeting. He shall attempt to complete the program in sufficient time so that it may be published in an issue of the journal prior to the meeting. He shall work with the committee on local arrangements. He shall work under the direction of the president, making frequent reports of the progress of the program.

Section 3. The duties of the vice-presidents shall be to aid the president. They shall assist the president in the furtherance of the work and progress of the Association.

Section 4. The secretary-treasurer shall keep a permanent accurate record of the proceedings of each of the meetings of the Association. He shall keep on file a correct list of the names of the officers, governing boards and members of the Association, their mailing addresses and a statement of their standing. He shall assist the president in carrying on the correspondence of the Association. He shall keep an itemized account of all receipts and expenditures and make a written report of the same to the membership regularly. The books shall be audited annually by a certified public accountant or by a special auditing committee of three members.

Article II

Nomination and Election of Officers

Section 2. Additional nominations may be

made by petition. Any local affiliated chapter may present a petition signed by at least half its chapter membership and listing the name or names of the nominations and the offices for which the nominations were made. Signers of such a petition should be members in good standing in the national Association. Furthermore the petition should contain the signatures of at least fifty members. If this number is in excess of the membership of the local affiliated chapter, other qualified members may be substituted for the additional number. When such petitions are presented to the secretary-treasurer he shall place the additional nominations on the ballots.

ARTICLE III

Duties of the Executive Board

In addition to the duties herein specified, the executive board shall have the power to regulate the Association on matters not specifically mentioned herein.

ARTICLE IV

Membership and Dues

Section 1. The membership dues of this Association shall be one dollar ($1.00) per year payable in advance. This membership includes subscription to the official journal.

Section 3. Those who on or before July 1, 1938, were members of an organization maintaining a periodical dealing exclusively with biological education on a secondary school level are entitled to membership in this Association on payment of special dues of twenty-five cents (25¢) per year. This special dues membership does not include subscription to the official journal.

ARTICLE VI

Officers and Boards of the Journal

Section 1 (in part). The members of the editorial board shall be appointed by the executive board.

ARTICLE VII

Chapter Affiliation

Section 1 (in part).
. . . . by petitioning the executive board . . . .
The ballot must be secret.

ARTICLE IX

Amendments to the By-Laws

Section 1 (in part). An amendment to these by-laws may be proposed by any affiliated chapter of biology teachers. Such proposed amendments to these by-laws shall be published in the official journal or by written notice to all members at least sixty (60) days

made by petition. Any group of 25 members in good standing or any local affiliated chapter may present a petition. A petition from a local chapter should be signed by at least half of its chapter membership and should list the name or names of the nominations and the offices for which the nominations were made. Signers of such a petition must be members in good standing in the National Association. The petition should contain the signatures of fifty members if possible. When such petitions are presented to the secretary-treasurer he shall place the additional nominations on the ballots.

ARTICLE III

Duties of the Board of Directors

In addition to the duties herein specified the Board of Directors shall have the power to regulate the Association on matters not specifically mentioned herein.

ARTICLE IV

Membership and Dues

Section 1. The membership dues of the Association shall be established by the executive board as described in Article IV, Section 4.

Section 3. Omit.

ARTICLE VI

Officers and Boards of the Journal

Section 1 (in part). The members of the editorial board shall be appointed by the Board of Directors.

ARTICLE VII

Chapter Affiliation

Section 1 (in part).
. . . . by petitioning the Board of Directors . . . .
Omit.

ARTICLE IX

Amendments to the By-Laws

Section 1 (in part). An amendment to these by-laws may be proposed by any affiliated chapter of biology teachers or by the executive board. Such proposed amendments to these by-laws shall then be published in the official journal or by written

before being voted upon by the executive board. Such proposed amendments shall also require a favorable vote of four-fifths (4/5) of the executive board.

Section 2 (in part).
. . . . before being voted upon by the executive board . . . .

notice to all members at least sixty (60) days before being voted upon at a regular business meeting. Such proposed amendments shall also require a favorable vote of two-thirds (2/3) of the members present and voting.

Section 2 (in part).
. . . . before being voted upon by the Association . . . .

Conservation Films

Of the 16 titles on conservation by the Encyclopedia Britannica Films, Inc., Wilmette, Illinois, two series seem especially appropriate in relation to the conservation education program of NABT. These were selected because they are all 16mm color, sound, 10 minute reels and all sell for the same price, $100.00. Each is a complete unit in itself although all are related and supplementary with some overlap in subject matter ideas, though little or none as to specific detail.

The Living Earth Series

Birth of the Soil Topsoil means food and life and here is the drama of the chain of life and the story of soil formation.

This Vital Earth is an excellent explanation of the living community and the total environment. Emphasis is given to the carrying capacity of the land.

Arteries of Life in showing the intimacy of streams, forests and humus causes us to ask whether it shall be fertile farms, desert, dust bowl, or buried under flood and silt.

Seeds of Destruction shows what happens with the failure of any one of the seven links of the chain of life: nature's raw materials, sun, chlorophyll, topsoil, the organic community, water, and forests.

The Living Forest Series

The Forest Grows and from this forest can be studied every major type of tree community in the United States and their ecology.

The Forest Produces timber and its products, 3½ million jobs, an abundant steady water supply, and the spiritual values which man can discover when alone in the wilderness.

Forest Conservation is the picture of waste as our forests disappear and with them water and topsoil with accompanying siltation of lakes and streams and the consequences of this siltation.

Educational Packet—for teachers or leaders of civic groups.

Water Pollution Series, Federal Security Agency, U. S. Public Health Service, Division of Water Pollution Control, Washington 25, D. C. *Free*

Lists of movies, drafts for speeches on pollution control, Draft of a state water pollution control act, Copy of Public Law #845 (80th Congress).

Cartoon booklet (Mark Trail). The Fight to Save America's Waters.

Several publications from the United Public Health Service.

This packet contains the best general background material on water pollution available. It is also available from the regional offices of the Division of the Water Pollution Control as well as the State Departments of Public Health.

The following films are available, free, from Federal Security Agency Regional Office, Upper Mississippi-Great Lakes Drainage Basin, Division of Water Pollution Control, 69 West Washington Street, Chicago 2, Illinois.

Waters of the Commonwealth (Pennsylvania), 16mm, color, sound, 25 min.

Lakes and Streams of Minnesota, 16mm, color, sound, 25 min.

A Tale of Two Cities (Minneapolis and St. Paul), 16mm, sound, color, 25 min.

Clear Water, 16mm, color, sound, 30 min. This is of more general interest since it does not apply to any particular local situation.

It shows beautiful natural waters and their destruction by pollution, as well as the basic means of preventing pollution.

The two films which are mentioned next are of more local interest than those first listed.

Our Water Heritage (Washington), 16mm, color, sound, 25 min.

River at Your Door (Middlesex Co., N. J.), 16mm, sound, color, 25 min.

Biology In The News

Bones by Andreas Feininger, *Life*, October 6, 1952, pp. 126–133.

You will want this series of excellent pictures to show how remarkably the skeleton is adapted to the needs of the particular animal. Two or more copies would be valuable additions to your permanent file.

War Against Cancer by Ben Merson, *Colliers*, October 4, 1952, pp. 24–29.

A progress report of the work of the research group at the Sloan-Kettering Institute which is searching for an effective means to kill stray cancer cells. The report is optimistic.

To Sleep Perchance by Richard L. Williams, *Life*, October 13, 1952, pp. 105–118.

Frequent misuse of pills which induce sleep, or of those which prevent it, obscures their value as medicines. The dangers accompanying the use of such pills, addiction, and various controlling regulations are clearly discussed.

They're Setting Fire to California by William L. Worden, *Sat. Ev. Post*, October 4, 1952, pp. 28–29 & 122–127.

Controlled burning of brush to recondition land for pasture and to eliminate wild fire hazards has its advocates and its enemies. Is such burning a shortsighted procedure?

America's Strangest Lumberyard by Joe Alex Morris, *Sat. Ev. Post*, October 11, 1952, pp. 29 & 170–174.

In this day of plastics we still can't get along without wood, and the demand for rare types is increasing. The Monteath lumberyard in the Bronx specializes in unusual woods. Here people come for wood to be used for purposes ranging from model airplanes to fine statuary.

Are Hunting Laws Obsolete? by J. P. Linduska, *Hunting and Fishing*, October, 1952, pp. 16–18 & 66–68.

Could we kill more upland game without notably reducing their numbers? Are present controlled seasons on grouse, deer and rabbits having the effects of ruining their ranges and reducing their reproductive capacity?

Arteriosclerosis by Maxine Davis, *Good Housekeeping*, October, 1952, pp. 13 & 196.

A report on the latest developments in the prevention and treatment of hardening of the arteries.

Atoms for Cancer by John Lear, *Colliers*, October 11, 1952, pp. 13–15.

What happens when you take radioactive isotopes? The author relates what Tommy Gilmore thought the isotopes did to him.

Looks Easy on Sunday by Elizabeth Coulson, *Colliers*, October 4, 1952, pp. 56–59.

Animals in the zoo must look healthy. Just how they are kept so is the subject of this interesting article.

THE ANNUAL MEETING of the *Central Association of Science and Mathematics Teachers* will be held November 28 and 29 at the Edgewater Beach Hotel, Chicago, Illinois. Dr. Raymond Kienholz, Professor of Forestry at the University of Connecticut, will be the banquet speaker.

DOES THE TEACHER HOLD THE MISSING SECTION? is the title of a 130-page mimeographed bulletin prepared by a seminar sponsored by the School of Education of Florida State University during the summer of 1952. The work was done in cooperation with NABT, and is directly in line with the three-year program of the Conservation Project of NABT. The following is quoted from the Foreword: ". . . Much of the information found in this bulletin came from field observations by the group. The cases cited are real, not hypothetical. We have tried to plan the units for *all* teachers, for *all* grade levels . . . . You may not be able to duplicate the experiences of this group, but we hope our experiences and suggestions will increase your awareness of the resources you have at hand."

Certain portions of the bulletin will be printed in ABT. Information about the bulletin may be obtained from Malvina Trussell, School of Education, Florida State University, Tallahassee, Florida.

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THE NATIONAL TEACHER EXAMINATIONS, prepared and administered annually by Educational Testing Service, will be given at 200 testing centers throughout the United States on February 14, 1953. Application forms and *Bulletin of Information*, together with sample test questions, can be obtained from National Teacher Examinations, Educational Testing Service, P. O. Box 592, Princeton, New Jersey. Applications for the examination will be received by ETS until January 15, 1953.

BOOKS

PYENSON, LOUIS L. *Elements of Plant Protection.* John Wiley and Sons, Inc., New York. x + 538 pp. illus. 1951. $4.96.

Elements of Plant Protection presents a wealth of correct information about the more important plant pests—insects, rodents, birds, weeds and pathogens. Though Dr. Pyenson has written the volume for those directly interested in agriculture, this book can likewise serve a most useful purpose on the high school reference shelf. For students as well as teachers, it is a ready source of basic facts about pests to our common economic plants. Long experience has given the author a thorough understanding of the problems of protection of cultivated plants and he writes clearly and practically about them. The illustrations are most helpful in recognizing pest effects and in tracing life histories. The book stimulates problem solving. It also furnishes much of the information necessary for their solution.

BROTHER H. CHARLES, F.S.C.
St. Mary's College,
Winona, Minnesota

AHLGREN, GILBERT H., KLINGMAN, GLENN E., and WOLF, DALE E. *Principles of Weed Control.* John Wiley and Sons, Inc., New York. XVII + 368 pp. illus. 1951. $5.50.

The purpose of this book is to present information about the chemical control of weeds. Special attention is given to the effects of 2,4-D and its derivatives on plants.

For easy reading and comprehension a knowledge of organic chemistry, plant physiology and botany would be helpful to the reader. However, the authors do well in providing a botany and chemical background as aids for interpretation. Data are given for the scientific control of all kinds of weeds—weeds in row crops, small grains and flax, in grass lands and highway right-of-way, in drilled and broadcast legumes, in vegetables and fruits, in drainage and irrigation ditches, lakes, ponds and on stream banks.

Attention is also given to defoliation, soil sterilants and the control of poisonous weeds. Information, with illustrations, pertaining to the maintenance and adaptability of various types of applicators is also included. In the appendix the authors list the susceptibility of most of the common weeds to 2,4-D. The book contains both a subject and author index; both are well organized.

This well written book will prove to be a valuable aid to farmers, vocational agriculture teachers, or any one interested in weed control. The authors do not assert that the eradication of weeds should be entirely by chemical means, but chemical methods should be used to supplement regular cultural practices.

H. F. Foster,
State Teachers College, Emporia, Kansas

Burton, Maurice. *Animals and Their Behaviour.* Edward Arnold & Co., London. 144 pp. 1950. $.60.

This little book describes migrations, hibernation, camouflage, play, mating, and other normal activities of animals. Associated with the British Museum in London, Burton has planned his book to help the amateur interpret his observations in terms of the animals' normal needs. He warns against interpreting such activities in terms of man's thoughts and feelings. Yet he lapses occasionally into explanations like that concerning a hawk that cannot catch a swallow: "While a hawk is trying to make up its mind which swallow it would like to kill and eat, which of the thousands flying by is the plumpest and therefore the most palatable, that lot have gone and more have taken their place; and the hawk must start making up his mind all over again." The final chapter suggests a number of projects for the nature hobbiest.

Weimer, Bernal O. *Man and the Animal World.* John Wiley & Sons, New York. vii + 569 pp.

Your reviewer believes that Dr. Weimer, in his book *Man and the Animal World,* has made an excellent contribution to the field of Zoology and Physiology. It is well written and an interesting book. As the name indicates, the organs and body processes of man are presented along with like organs or processes of other animals. The book has twenty-six chapters, the first fourteen of which (222 pages) are devoted to this anatomical and physiological presentation. There follow two chapters dealing with heredity, a chapter on taxonomy, five on the animal phyla, one on ecology and three on the origin of life and evolution.

The book has a good cloth binding, with 9″ × 5¾″ page size. It is well illustrated with 296 figures and 16 color plates. A skillful 38 page combination of glossary and index completes the book. It is written primarily for a college textbook in Zoology. Technical terms are defined and derivations given when first used. He has included such an up-to-date topic as the Lysenko controversy and gives a modern treatment of vitamins and hormones. The book should be on High School and College reference shelves for classes in Zoology and Physiology.

M. A. Russell,
Highland Park Junior College, Highland Park, Michigan

Bullough, W. S. *Practical Invertebrate Anatomy.* Macmillan & Co., London. xi + 463 pp. 1950. $4.50.

The beginning of each chapter on invertebrate phyla, from Protozoa up to and including Chordata, describes the general characteristics of the phylum, class, and order of the invertebrates commonly used for study in college zoology. For each representative

listed under the genus name, the general account, anatomy, conclusions and references are presented. The general account is a description of the life history of the individual. Under anatomy, the general structure is described, with important words in bold-face type to facilitate the laboratory work on the study of the specimens. As conclusions the author suggests particular characteristics to be noticed and the characteristics of the phylum, class, and order to be compared with that of the specimen being studied. Many of the references listed are of little value to the average small college student as some are written in foreign languages and others cannot be obtained in an average small college library.

In the reviewer's opinion, the section on the anatomy of the specimens might well be separated into a laboratory manual as the text is cumbersome to handle during the lab work. The rest of the information given in the book is excellent reference material. The paper of the text seems poor, however, and might not stand hard wear in the laboratory. The text is easily read and a person can quickly find the description of the specimens he wishes to look up. The table of contents is comprehensive; listing the phylum, class, order, genus, and the common names of all the representatives given in the book. There are 168 excellent figures and the text is concluded with general references, general appendix, index of authors and general index.

Lois Redmond,
State Teachers College,
Emporia, Kansas

Dobzhansky, Theodosius. *Genetics and the Origin of Species.* Third edition, revised. Columbia University Press, New York. x + 363 pp. 1951. $5.00.

Theodosius Dobzhansky, professor of zoology at Columbia University, is known throughout the world for his studies and writings in evolutionary biology. In the revision of the third edition the author has incorporated the results of recent investigations throughout the discussion of the entire book. The fundamental principles of evolution are clearly discussed in the light of recent findings of geneticists, systematists, paleontologists, ecologists, embryologists, physiologists, and comparative anatomists.

The discussions in all chapters are completely rewritten. There are ten chapters as follows: organic diversity, heredity and mutation, mutation in populations, selection, adaptive polymorphism, race formation, isolating mechanisms, hybrid sterility, species as natural units, and patterns of evolution. A chapter on polyploidy was omitted in this edition. There are approximately 900 complete literature citations, and there is an index.

The discussions are easily read and are thought-provoking. Every teacher of biological science should find this book stimulating and informative.

Ted F. Andrews,
State Teachers College,
Emporia, Kansas

Edmond, J. B., A. M. Musser, F. S. Andrews. *Fundamentals of Horticulture.* The Blakiston Company, Philadelphia 5, New York 22. 502 pp. 30 tables. 149 illus. 1951. $5.50.

The authors have cooperated in developing a good textbook for a course in the fundamentals of horticulture. It can be applied to either the quarter or semester systems, and need not be restricted to any particular region of the United States.

This book is divided into three parts. The first is primarily concerned with the general field of botany on plant growth and development. The fundamental principles and processes are brief, but concise and described in accurate, well written botanical terms. Part two deals with the principal horticultural practices and factors such as propagation, soils, climates, and many others. Part three is a complete book in itself, covering the principal horticultural crops of fruits, vegetables, and ornamental plants.

Each part is also divided into assignments with questions following each assignment. Concluding each part is a list of selected references. At the bottom of each page is the assignment number, chapter number, and page number. This division into assignments may be unnecessary as few teachers

(*Continued on p. 198*)

THE STAFF

In order that readers may know who carries the chief responsibilities in the activities of THE NATIONAL ASSOCIATION OF BIOLOGY TEACHERS and *The American Biology Teacher* it is the policy of the journal to publish twice a year, in the November and March issues, a complete list of the staff members. Lists of chairmen and personnel of committees are published in connection with reports of their activities.

All these individuals are deeply interested in the improvement of both the association and the journal. They welcome suggestions from members and are ready to give assistance to anyone interested in writing items or other articles for the journal.

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BACK NUMBERS

Most issues of the American Biology Teacher, except those of 1938–39 and 1939–40, are available.

For information write

JOHN P. HARROLD,
110 East Hines St.,
Midland, Mich.

will follow a set pattern. The illustrations and figures included are good except for a few photographs that are indistinct.

This book has an attractive green cover and can be easily read, as the pattern of presentation is fairly continuous throughout the book. It can be used in either non-agricultural colleges, where pre-agricultural courses are offered, or in a regular agricultural college. This text will make an excellent reference book for the average agricultural teacher or biology teacher in the secondary schools.

KENNETH W. MINTER,
State Teachers College,
Emporia, Kansas

IMMS, A. D. *Insect Natural History.* Blakiston Co., Philadelphia. 1951. xviii + 317 pp. $0.00.

This is one of a series of books on the insects of Great Britain. It is intended for general readers, though teachers of nature study or elementary biology will find it very useful. In so far as possible, technical terms and details of anatomy and classification which would have meaning only to a student of zoology have been avoided.

The book is exceptionally well illustrated. There are 105 color photographs, 104 photographs in black and white, 8 distribution maps, and 40 diagrams. It has a good index which enables one to refer quickly to any insect discussed. Arabic numerals in heavy type after the names of insects indicate color plates; Roman numerals indicate black and white plates. A Documentary Appendix to other books and papers dealing with insect life is another outstanding feature.

The subject matter is divided into thirteen chapters. Particular emphasis is applied to feeding habits of insects, social behavior of insects, and aquatic insects. Little space is devoted to the Lepidoptera since another book of this series deals primarily with the butterflies and moths. The material is well presented in an interesting manner, and the print is easily read. It is securely bound in a 6" × 8½" heavy cardboard covering.

VIRGIL E. DOWELL,
State Teachers College,
Emporia, Kansas